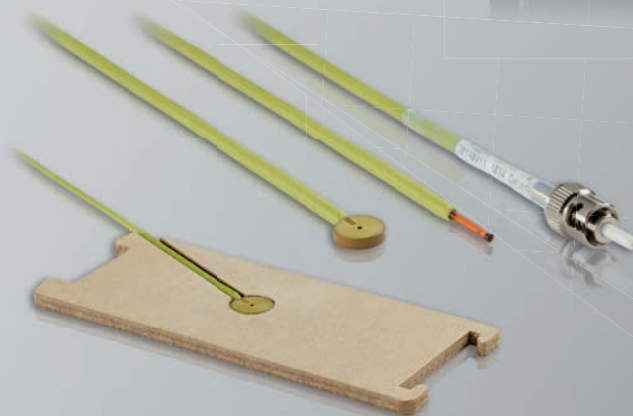




MSENSE® FO

# FIBER-OPTIC ONLINE TEMPERATURE MEASUREMENT.

[WWW.REINHAUSEN.COM](http://WWW.REINHAUSEN.COM)



# THE TEMPERATURE CURVE OF YOUR TRANSFORMER.

Power transformer failures result in substantial costs. Precise overload management guarantees a long service life and efficient operation.



## Detecting hot spots at an early stage

According to a study from CIGRE, winding problems are the cause of 45% of transformer failures.

A mere increase of 12°C in the winding temperature drastically reduces the service life of the transformer by 75%.

Conventional winding temperature measurements provide a calculated, average display of the temperature profile. Precise hot spot detection can be crucial, particularly in critical applications.

## Online winding temperature in real time

The MSENSE® FO combines several assemblies in an innovative design for fiber-optic online temperature monitoring. The practical MSENSE® FO system for your power transformer is the result of combining this design with decades of experience in the field and a great deal of expertise.

The most important advantages:

- Simple integration into the design and value chain of a power transformer
- Durable, standard-compliant and practical
- Innovative preparation and processing of all measured values
- Connection to SCADA and digital management systems, e.g. ETOS®.

The MSENSE® FO system is the key to hot-spot detection and your effective tool for dynamic overload and lifetime management, ensuring a high level of operational reliability and efficiency.

# PRECISE MEASUREMENT OF THE WINDING TEMPERATURE.

The MSENSE FO system accurately depicts the winding temperature continuously in real time.

## Fiber-optic sensor 1

- User-optimized solutions
- Based on GaAs technology
- Extremely low PD performance ( $< 2 \text{ pC}$ )
- Very high tensile force ( $> 60 \text{ N}$ )
- Surpasses ASTM D3426 and D-149 standards



## System solution: MSENSE® FO ECU-I 3

Electronic unit for GaAs technology for direct integration into ETOS®

- 8 or 12 sensors supported
- Internal reference sensor for maximum reliability and availability
- Including MSET-FO software
- Up to 3 units can be easily integrated into ETOS®



## Stand-alone solution: MSENSE® FO ECU-S 3

Electronic evaluation unit for GaAs technology for independent monitoring of the winding temperature, including a display

- Up to 16 sensors supported
- Internal reference sensor for maximum reliability and availability
- Including MSET-FO software
- 8 programmable relay outputs (optional)
- 8 programmable analog outputs (optional)
- IEC 61850, DNP 3.0 and Modbus TCP (optional)



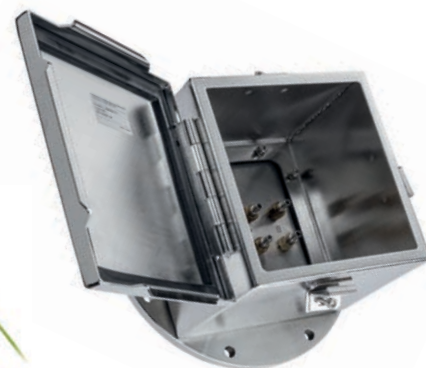
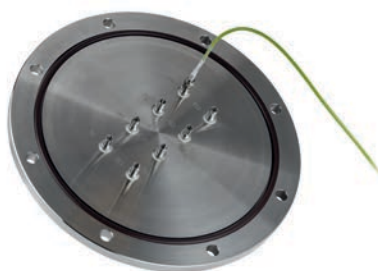
## Technical features

- Measuring range: -80°C to +200°C
- Resolution: 0.1°C
- Accuracy:  $\pm 1^\circ\text{C}$

## Accessories 2

Bushing and mounting flange

- Pre-installed optical bushings (optional)
- Leakage test performed ex works (optional)
- Protective housing in IP65 standard (optional)

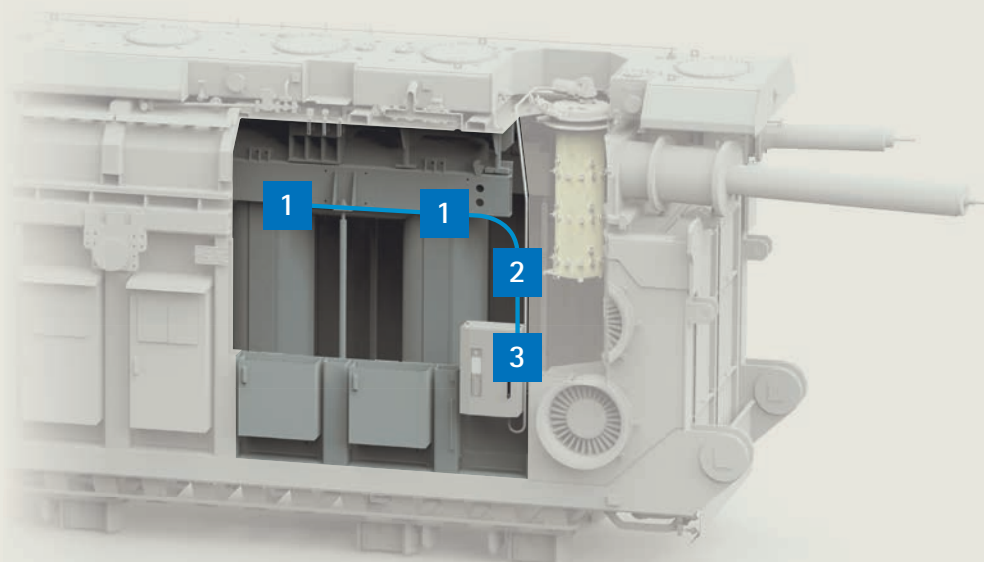


## Optical connecting cable

- For single-fiber or multi-fiber use for up to 12 fibers
- Environment- and user-based resistance and properties



## MSENSE® FO: installation and components

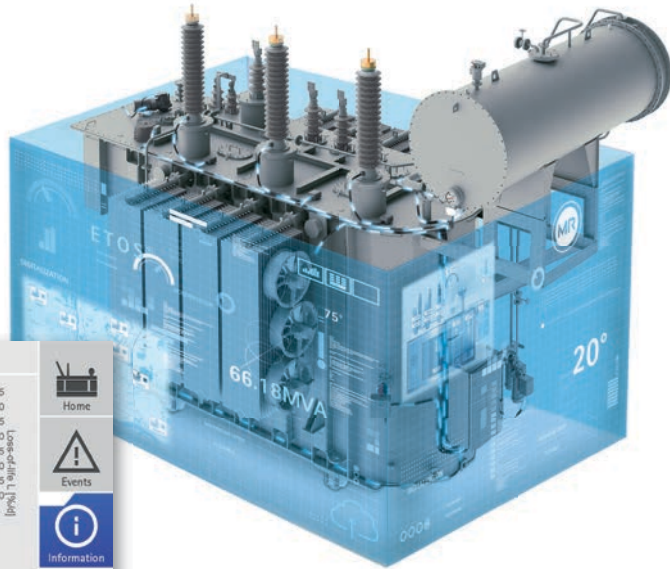
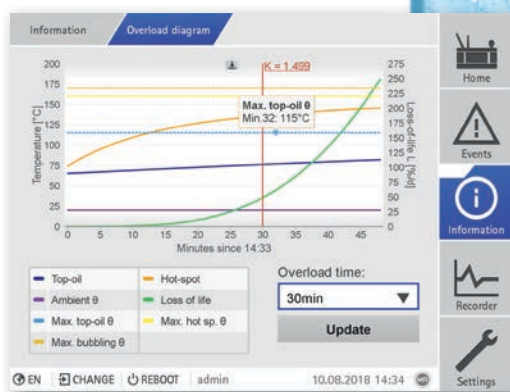


# OVERLOAD AND ASSET LIFETIME MANAGEMENT.

Intelligent preparation and processing of temperature data in ETOS®, the innovative MR system solution.

Manage overload and asset lifetime by integrating MSENSE® FO into ETOS®

- Dynamic overloads
- Improved temperature management
- Data-based asset lifetime management
- Data-based asset management



## MSENSE® FO test unit

For use during installation, heat run tests and quality assurance

- 4 optical input channels
- Measuring range: -80°C to +200°C
- Accuracy: +/- 1.0°C
- Power supply via USB 2.0 and rechargeable battery
- 100% prevention of irreversible errors in the production process of transformers



# MSENSE® FO. AN OVERVIEW OF THE HIGHLIGHTS.



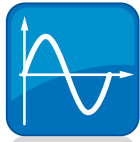
## High level of expert knowledge of MR and its partners

- 50% of electricity worldwide flows through MR products
- Our value proposition: precision, quality, and a long service life



## Prevention of costly transformer failures

- Assurance of proper transformer function
- Assurance of equipment service life
- Protection of investment/assets



## Monitoring of dynamic loading to guarantee grid stability

- Dynamic overloads
- Improved temperature management
- Data-based asset lifetime management



## Extremely simple integration into the value chain and ETOS®

- A wide variety of installation options that meet the most stringent requirements
- Preconfigured for ETOS



## 24/7 MR service

- 8,000 customers in 185 countries
- 49 locations with 7 training centers

**Maschinenfabrik Reinhausen GmbH**  
Falkensteinstrasse 8  
93059 Regensburg, Germany

Phone: +49 941 4090-0  
E-mail: [info@reinhausen.com](mailto:info@reinhausen.com)  
[www.reinhausen.com](http://www.reinhausen.com)

THE POWER BEHIND POWER.

